Notice of Allowability	Application No.	Applicant(s)	
	10/538,089	REY-FABRET ET AL.	
	Examiner	Art Unit	
	Suzanne Lo	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *application filed 06/08/05*.

2. ☒ The allowed claim(s) is/are *1-4*.

3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 06/08/05
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

KAMINI SHAH
SUPERVISORY PATENT EXAMINER

DETAILED ACTION

1. Claims 1-4 have been presented for examination.

PRIORITY

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d).

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 06/08/05 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the Examiner has considered the IDS as to the merits.

Allowable Subject Matter

4. Claims 1-4 are allowed.

5. The following is an examiner's statement of reasons for allowance:

Applicants are disclosing a method intended for real-time modeling of the hydrodynamic behavior of a multiphase fluid flow in a transient phase in a pipe using neural networks. This has been disclosed in the prior art of record.

The prior art of record does not disclose the method intended for real-time modelling of the hydrodynamic behaviour of a multiphase fluid flow in transient phase in a pipe, characterized in that it comprises: constructing several neural networks (E.sub.Stra, E.sub.Disp, E.sub.Int) respectively dedicated to different fluid flow regimes, *constructing a probability neural network (RN.sub.Proba) suited to evaluate at all times the probabilities for the flow in the pipe to correspond respectively to the various flow regimes, and combining the results provided by the various neural networks weighted by said probabilities.*

The closest prior art uncovered during examination teaches certain limitations of the claimed invention as follows:

U.S. Patent Application Publication 2002/0082815 A1, Rey-Fabret et al. : Discloses the method intended for real-time modelling of the hydrodynamic behaviour of a multiphase fluid flow in transient phase in a pipe **([0016])**, considering fixed operating conditions concerning a certain number of determined structure parameters relative to the pipe and a set of determined physical quantities, with fixed variation ranges for said parameters and said physical quantities **([0018]-[0022])**, by neural networks with inputs for structure parameters and physical quantities **([0018]-[0021])**, and outputs where results necessary for estimation of the hydrodynamic behaviour are available **([0022])**, and at least one intermediate layer **([0027])**, the neural networks being determined iteratively so as to adjust to the values of a learning base with predetermined tables connecting different values obtained for the output data to the corresponding values of the input data **([0029], [0037])**, characterized in that it comprises: constructing several neural networks (E.sub.Stra, E.sub.Disp, E.sub.Int) respectively dedicated to different fluid flow regimes **([0043])**. However, Rey-Fabret does not disclose constructing a probability neural network (RN.sub.Proba) suited to evaluate at all times the probabilities for the flow in the pipe to correspond respectively to the various flow regimes, and combining the results provided by the various neural networks weighted by said probabilities.

"A Modular Neural Network Vector Predictor For Predictive VQ", Wang et al.: Discloses constructing a probability neural network derived from several individual neural networks which evaluates the probabilities of said individual networks and combining the results weighted by said probabilities **(page 432-433, Method 4 and Figure 1)**. However, the neural network construction method, Mixture of Experts, is directed to the field of Predictive Vector Quantization and does not teach neural networks in the field of modeling hydrodynamic behavior.

"Recurrent Neural Network using Mixture of Experts for Time Series Processing", Tabuse et al.: Disclose the neural network construction method, Mixture of Experts suited to evaluate at all times

(page 537, Section 3, "Mixture of Experts") but again does not teach neural networks in the field of modeling hydrodynamic behavior.

6. It is further noted that the examiner has given patentable weight to the preamble of independent claim 1 since, in this case, the preamble limits the body of the claims. MPEP 2163 recites the following:

> "The examiner should evaluate each claim to determine if sufficient structures, acts, or functions are recited to make clear the scope and meaning of the claim, including the weight to be given the preamble. See, e.g., Bell Communications Research, Inc. v. Vitalink Communications Corp., 55 F.3d 615, 620, 34 USPQ2d 1816, 1820 (Fed. Cir. 1995) ("[A] claim preamble has the import that the claim as a whole suggests for it."); Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1257, 9 USPQ2d 1962, 1966 (Fed. Cir. 1989) (The determination of whether preamble recitations are structural limitations can be resolved only on review of the entirety of the application "to gain an understanding of what the inventors actually invented and intended to encompass by the claim.")."

In this case, the preamble recitation of "method intended for real-time modelling of the hydrodynamic behaviour of a multiphase fluid flow in transient phase in a pipe, considering fixed operating conditions concerning a certain number of determined structure parameters relative to the pipe and a set of determined physical quantities, with fixed variation ranges for said parameters and said physical quantities, by neural networks with inputs for structure parameters and physical quantities, and outputs where results necessary for estimation of the hydrodynamic behaviour are available, and at least one intermediate layer, the neural networks being determined iteratively so as to adjust to the values of a learning base with predetermined tables connecting different values obtained for the output data to the corresponding values of the input data," *is further defined and limited in the body of the claim as defined by several neural networks each modeling a different fluid flow regime.*

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. These references include:

1. U.S. Patent No. 5,550,761 issued to Pauchon et al. on 08/27/96.

2. U.S. Patent No. 6,028,992 issued to Henriot et al. on 02/22/00.

3. U.S. Patent Application Publication 2002/0016701A1 published by Duret et al. on 02/07/02.

4. "Flow regime identification methodology with neural networks and two-phase flow models" published by Mi et al. in 2001.

5. "The role of neural networks in fluid mechanics and heat transfer" published by Ashforth-Frost et al. in 1995.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suzanne Lo whose telephone number is (571)272-5876. The examiner can normally be reached on M-F, 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamini Shah can be reached on (571)272-2297. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Suzanne Lo
Patent Examiner
Art Unit 2128

SL
9/28/06

KAMINI SHAH
SUPERVISORY PATENT EXAMINER